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MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

PUEBLO ENVIRONMENT.[1]

THE southern portion of the Rocky Mountain Highland has two chief geographic features, the one a depression called the Great Interior Basin and the other the Pueblo Plateau. The latter may be subdivided into the Rio Grande Valley, the Colorado Plateau and the Gila Slope, lying in the four political divisions named Colorado, Utah, Arizona and New Mexico.

This plateau, which contains the bulk of the elevation on the western half of the United States, is mainly embraced in the triangle lying between the eastern side of the Rocky Mountains and the Rio Colorado, the western side being bounded by the Great Basin. Its slope is from north to south in the eastern portion where the Rio Grande drains the trough lying just east of the continental uplift, but the main slope is toward the southwest and is drained by the Colorado and its affluents. The plateau lies from four to ten thousand feet above sea level, but there are great contrasts in elevation from 14,000 feet above to 300 feet below the datum. In this region the north and south ranges of the Rockies break up and form a complex of mountains running

[1] Address of the vice-president and chairman of Section H—American Association for the Advancement of Science, New Orleans, December, 1905.

east and west, plateaus, plains, basins, buttes, broad valleys and narrow canyons giving great diversity of the most remarkable natural features to be found in the world.

The geology is that of later rocks, principally the easily eroded Cretaceous and other Mesozoic formations. Tremendous volcanic activity in former times has poured out vast floods of lava which, together with tufas or agglomerated ash, form the most noticeable physiographic features of the region.

Latitude, elevation and natural barriers here conspire to produce modifications in climate. This is seen in the convolutions of the isotherms of 50°, 59° and 68° crossing the region, the scanty rainfall occurring in the winter and summer months, the excessive insolation, the extremes of day and night temperature, the high winds and rarefied air, which characterize the arid environments.

The fitness of the southwest to sustain biotic forms depends mainly upon rainfall, which itself is regulated by cosmic and geographic conditions. Thus the uprush of heated air from the sun-baked plateaus during the summer draws in the moisture-laden air from the oceans, producing rains which are unequally distributed; the higher mountains, acting as condensing centers, receive the most, while the plains are scantily watered. The receptivity of the land must also be considered, the mountains covered with vegetation storing water, and the bare land shedding it into the rivers, which must carry at times vast floods and during long periods remain perfectly dry. Everywhere is evidence of the colossal agencies which are at work reducing the land to sea level. This workshop is littered with the bones of the mountains, and the dust that is sorted by water and wind moves freely to lower levels or is blown higher to again resume its gravitational course.

Despite the generally adverse conditions set forth, there flourishes here a flora of a peculiar character which forms the basis of subsistence for an extensive fauna, and also the newcomer, man, who has pinned much of his faith to nature's supply. The region is not in any part a desert in the true sense of the term, which is applied to lands deserted because of an inhibition of life, but it is rather a semi-arid environment, in which a preponderance of desiccative and other factors have restricted and minimized life. These restrictions are observed in full force among the plants fixed in the earth, and therefore played upon by all the natural forces, to which they must adapt themselves by slower changes than are required by higher biotic forms. The characteristic climatic flora is thus xerophytic where the leaves are small, with structures for preventing too rapid evaporation, stems contain chlorophyl and act when leaves fall away, etc.; these are adaptations which give some plants the freedom of the desert. Other plants are succulent and spring to quick fruition when rains occur; other plants have perfected water-storing organs in stem, root and branches, as the cacti, yucca, atriplex, sarcobatus, etc., and still others can live in soils containing an excess of mineral salts.

Most of the desert plants bear witness to the struggle with sun, wind, rarefied air and inhospitable soil; thus they present a gnarled, wrinkled and bizarre appearance, often simulating trees dwarfed by the gardener's art. Unlimited opportunity is here for isolation by natural boundaries, which, if not a factor in the origin of species, at least powerfully aids in their preservation.[2]

[2] Discussion by Jordan, Bailey and others, in recent numbers of SCIENCE. The Desert Laboratory of the Carnegie Institution, near Tucson, Ariz., is attacking these problems with enthusiasm.

Much that is observed as to plant life is true also of animal life, giving a facies by which Merriam's austral regions may be characterized.

In all discussions of this environment, little or no attention has been paid to the effects of light, which is here at its maximum. Without entering into detail as to the physiological sequelæ of light from other parts of the spectrum, the rays from the violet end may be considered. These rays affect all life submitted to them in a harmful manner by checking or prohibiting cell growth or metabolism. It will be found that many of the protective features of xerophilous plants and of animals which are attributed to aridity, rarefied air, soil, etc., are adaptations due to avoidance of dangerous rays of light. This is to be noticed in the habit of some delicate plants which thrive in the shade of hardy plants, the protective covering and nocturnal habits of animals, and the architecture and shelter instincts, as well as skin color of the ancient and modern Indians who lived in caves, cliff shelters or cavate houses, or whose pueblos as a whole or as to the individual houses were constructed to admit a minimum of light, but from far different causes, though still environmental pueblos were generally oriented with reference to the east; first, for the utilitarian purpose of receiving the early morning sun, grateful after the chilly nights of the high regions; and second, on account of the importance of the rising sun in heliolatry.

Such were the general features of the great area under consideration and on the whole the characteristics are constant to the present time, but it is difficult to realize the immense modification of animal and vegetal life which the white man has wrought in this region during the thirty years of his active occupancy. At the beginning of this period the region was well grassed and supplied with other vegetation adequate to the needs of vast herds of antelope, elk and deer; rodent animals and birds were plentiful and carnivores had abundance of prey. As a result of vegetation a humus had formed on all protected situations, rainfall was absorbed and equalized in distribution and the terrific denudation which gashes the land at present was not begun.

The country was adapted to grazing and especially favorable on account of temperature and latitude, and at once great herds of cattle, horses and sheep were introduced from Texas where pasturage had failed. The result was that the range became overstocked, the grass disappeared under the tongues and hoofs of myriads of domestic animals; shrubs and trees were browsed and destroyed or swept away by fires; from certain regions species of plants vanished; and the land lay bare to the augmented winds and torrential rains. Trails became profound arroyos, the humus vanished into the streams and the surface of the country was stone, sand and gravel. Not the least of this baneful influence was the drying up of springs and other sources of water, and more than one observer collected data going to prove the progressive desiccation of the pueblo region. These facts must be borne in mind in discussion of the environment of the southwest. As an example, it may be stated that in the exploration of one ancient pueblo at Winslow, Ariz., the bones of thirty-seven species of animals were taken from the house refuse; it is not probable at present that a naturalist could collect five of these species from the environment. Wherever the explorer's spade has been put into the ancient ruins, facts of this character come to his notice, even if he has not heard the story from the early settlers or Indian traditionists.

There is no doubt that cycles of dry and wet seasons occur in the southwest, but the

periods have not been definitely observed. Inferential data have been secured from exploration in the ancient ruins that render it possible to explain the migrations of early populations.

The conditions of the environment briefly recapitulated are:

1. A plateau of considerable elevation isolated geographically.

2. Slight rainfall, locally distributed; absence of cloud blanket; excessive light, radiation and evaporation; high winds, dust storms; rarefied air.

3. Forested mountains, plains with xerophytic, hydrophytic and halophytic vegetation; plant colonies; desert animals.

Within this general enclave we have several subenvironments which may be considered from the point of view of the availability for habitation by man.

Subenvironments:

1. Prohibitive to man and in great degree to animal and vegetal life.

2. Precarious except to man in low grade of culture, as roving, hunting and primitive tribes. Animal and vegetal life sufficient.

3. Habitable by man acquainted with agriculture, but more or less precarious.

4. Favorable for agriculture and production of economic surplus.

The subenvironments more favoring in the struggle for existence are:

1. Mountains at sources of rivers. Here are narrow valleys for agriculture with occasional irrigation; game, nuts, fruits and plants; timber, building material, etc. The temperature cold, with short growing season.

2. High plateaus with marshes, lakes, ponds. Land lying well for catchment of water. Temperature as in 1.

3. Mesa country, with broad plains and valleys; springs; streams flushed at seasons.

4. Riverain lands in lower stream valleys suitable for irrigation by canals or warping.

The effect of this environment upon plants is to reduce them to their lowest terms; animals, to modify them in important ways; man, to subject his mind to the stress of severe conditions, reacting noticeably on his body, and mightily on his thought and material progress.

The environment was suitable, or extinction of tribes followed or a movement was made to a new subenvironment. Thus the constant and seemingly erratic migration of tribes which have covered the Pueblo region with remains of ancient towns may have been due to natural causes which disenvironed them, such as earthquakes, failure of springs, etc. The final localization of the Pueblos is an index, in large measure, of the regional fitness.

It is probable that the tribes coming into the pueblo environment were at first confined to mountain regions where there is a permanent water-supply and natural subsistence, and that gradually they spread along the watercourses and into all the subenvironments. With the increase of population, the building of permanent villages of stone, the beginning or extension of the agriculture of maize, which cereal is a major factor in the distribution and permanency of tribes, the settlement of the Pueblo region went on apace.

It is apparent that in the advanced culture stage of the Pueblos the privations of environment had less restrictive character than in earlier stages. Gradually they attained superiority to the environment which had worked on them to the extent of its capabilities, and this has been the history of the growth of mankind.

Thus the regions least favored, in fact prohibitive to tribes who had not the schooling of experience, became the seed-fields of advanced tribes. Given unfailing springs as a starting point, the waste sand flats of

streams occasionally and temporarily filled with water became corn-fields which yielded bountiful returns to the Indian agriculturist. These regions gave the surplus which is necessary for the building of an advanced civilization and here rather than in the favorable subenvironments arose the true agriculture of cereals, on which basis the civilizations of the world now rest.

The environment determined largely the methods of application of water to land. North of the great ridge which crosses the southern portions of Arizona and New Mexico, forming the watershed of the Gila-Salt River, are found the more primitive methods of irrigation, that is by simple canals diverting water from streams to the nearest land and by warping or spreading by means of slight temporary barriers a fan of water from a point in the stream where the bank and bed of the stream are at a uniform level. South of the ridge which absorbs the cloud moisture and diverts it into the Gila is found a more complicated system in the trunk and lateral canals of great extent employed by the Indians who inhabited this region. Here the rivers lent themselves to irrigation and the agricultural tribes were led to employ the facilities to their betterment.

The somatology and culture of the Pueblo Indians in ancient times are known to have presented a remarkable uniformity, and here may be found an argument for the compelling, panurgic force of the environment. Time and isolation must be considered as concomitant factors in the formation of a Pueblo type under the peculiar transforming character of the environment, which, while it produced uniformity in many respects, may have tended to perpetuate the five language stocks that prevail in the region.

The most obvious effects of Pueblo environment are those connected with irrigation, architecture, arts and religion, and in the last the fullest sway of its causation is shown.

Without doubt the following of these and other lines of inquiry relating to the habits and customs of the Pueblo Indians will be productive of valuable material on this subject, necessarily but sketched in this communication.

WALTER HOUGH.

NATHANIEL SOUTHGATE SHALER.[1]

IN ever-growing measure for over forty years, Nathaniel Southgate Shaler made himself part of our life and gave the service of an intensely active personality to the college and the country.

He had an unusual range of experience in contact with the world of men and work: a boy in a slave-holding community, a young officer of the Union army in the civil war, later the director of a survey in his native state and member of various commissions in the state of his adoption, practised field geologist in many parts of this country, observant traveler abroad, expert in two bureaus of the national government, adviser of mining enterprises in the south and west, writer in many fields, orator and poet on our days of celebration, he thus gained that wide acquaintance with external affairs which made him so invaluable a Harvard man: student at eighteen, lecturer at twenty-three, professor at twenty-seven and dean at fifty.

He was impatient of seclusion in his work, and therefore related himself, but without a trace of self-seeking intrusion, to all phases of university life. Confident and courageous, abounding in initiative, he gave direction to work around him and turned the course of events. Inventive and independent, strikingly individualized, he worked to best advantage as a leader or alone, not as one of two; if other names

[1] Minute adopted by the Faculty of Arts and Sciences of Harvard University.

have occasionally been linked with his, the association showed his generosity rather than his need.

He was always devoted to the development of his own department, which grew and flourished under his leadership; he foresaw success for other departments which came into existence under his fostering care; he made the summer months educationally useful as they had never been before; he brought new life into an old school, and he inspired and guided the creation of a new and greater school to be, of which he was marked for the first officer. So wide a distribution of academic interests might well have weakened the efficiency of a less active man; but he was vigilant and faithful even to the details of his varied administrations; discerning and cautious in action where risks were great, yet ever ready to essay new methods and bold in taking risks where judgment advised a venture; unceasingly alert in his endeavors for the betterment of all our work; untiringly ingenious in the invention of new devices for enriching the opportunities of the university and for extending the influence of learning; cheerfully assured that, however great the task to be done, strength would always be found to do it.

While he was indifferent to the conventions of fashion and to whatever seemed to him hollow or excessive in forms or ceremonies, he was sincerely courteous in manner, and he therefore carefully retained some formalities in daily intercourse which others have carelessly abandoned. He was simple in his tastes, and his house and household were simply and genuinely hospitable. It was as much his courtesy as his appreciation of good business methods that made him punctilious in keeping all appointments. He was unaffectedly, unconsciously original and picturesque in bearing and in speech; to the end a staunch Kentuckian, though citizen of another commonwealth for nearly half a century. He was outgoing in his relations alike with friends and with strangers, seldom waiting for others to make advances, yet unreservedly responsive if they did; valuing the enlivenment of ideas that springs from free discussion and the mental exhilaration that comes of hearty laughter in good company, and always finding the good in any company that he met; possessed of a retentive memory that brought pertinent events from the crowded past, fresh and glowing, into the service of the present; fond of reminiscence thus abundantly supplied, and of citing the bearing of former adventures on the case just now in hand, but this in the most natural manner, without conceit or selfishness, and therefore always entertaining to his listeners, who never failed to make him the center of their group.

Beyond his university duties he had a keen sense for outside business affairs, and his advice was often sought by practical men on practical matters. He was more mindful of his civic duties than most of us are, and well known to his fellow townsmen of all stations, who did not fail to testify in fitting manner to this exceptional departure from the unintentional reserve of absorbed professors.

He was a good judge of men, for he had scrutinized many members of his vast acquaintance; he was loyal, encouraging and trustful with his associates, a lover of every reasonable liberty of individual judgment and conduct, and serviceable to many of us through his broad sympathy, his helpful suggestions and his interested inquiries. He was vigorous, even vehement, in the outspoken expression of his opinions, sometimes overriding his opponent with confident assertion—'traversing,' he used to call it—but expecting as frank and direct treatment in return. To the open antagonist he showed respect, even when most engaged in controversy, and a warm gener-

osity which outlasted many a sharp difference, for he wished to be fair-minded even when most a partisan. He was displeased with unspoken opposition, and affronted by circuitous methods, denouncing in unmeasured terms what seemed to him the unfair indirection of certain legal and political devices.

How warm was his greeting to old friends, on meeting them again; how hearty his welcome to the newcomer, whether colleague, student or passing stranger. No one here had more numerous or more beneficent personal relations with all sorts of persons, within and without the university. He had an intense fondness for young men, and took every opportunity of aiding them to idealize their lives, for he was genuinely solicitous for their welfare. He gave his time freely to consider the case of each student who applied to him for counsel, always preferring to act on the basis of individual judgment rather than under the guidance of rule or precedent. He was deeply sympathetic towards all sufferers, and made it his own affair to succor and relieve them. Yet he was unsparing, even scathing, in his condemnation of those whose conduct seemed to him dishonorable.

One might have thought, in view of his plans and committees for the reception of new students at the beginning of the year, and in view of his welcome for them at his house all the year round, that to make Harvard more hospitable was his chief aim, were it not remembered at once that he had many chief aims; for besides his extraordinary power of engaging effectively in an uncommon variety of practical tasks which drew largely on his day's work, he had an eager and watchful interest in the scientific study of the facts and processes of nature, regarding which he was always a thoughtful observer, an independent inquirer and a most ingeniously speculative theorizer. Thus at once naturalist and humanist, he exemplified the wider interests of an earlier time, before specialization had been forced upon us. Yet with all the diversity of his activities, he loved the unity of science as he loved the unification of university work. It was largely from the point of unity and continuity that he revealed the order of nature to the thousands of students who attended his lectures these many years; the interaction of the sun, winds, oceans, lands and life being the main theme in his presentation of geology, while his treatment of paleontology was directed to describing the ancient forms of life, not merely for themselves, but as the ancestors of the present inhabitants of the earth. He never limited his attention closely to one line of inquiry, but was always keenly interested in a wide variety of natural and human phenomena; and one sign of this was the manner in which he would consult his colleagues on unexpected topics. He was especially fond of tracing the connections which bind together the various regions of knowledge, showing at once the naturalist's love of detail and the philosopher's fondness for large problems.

Truth in matters of science attracted him for much the same reason that made him love fidelity of conduct; for through both the individual human life is kept in closer touch with the life of the universe. He loved to dwell on whatever showed that human nature is deep-rooted in universal nature, the outcome of a long process of evolution. Those who gained the great privilege of close acquaintance with him found, beneath a thousand other things, a deep reverence for humanity, and learned that a great zeal for the dignity and elevation of his fellow men was the center of his life. It seems strange that a man so strongly imbued with a feeling for others as to have been the center of a warm affection in his wide circle of friends, so effective in reaching others as to have impressed

his personality on college and community more profoundly than any Harvard teacher of his generation, should have sometimes been overcome by the hopelessness of trying to express one's personality at all. This but reveals the delicate elements of his inmost character; a warmth of emotion hardly to be expected of one prevailingly so cheerful, a sensitiveness to misunderstandings and estrangements hardly to be looked for in so aggressive a man. These qualities only made him the more humane in his dealings, and led him to set a higher value on whatever might help towards sympathy and mutual knowledge. Hence he urged the deliberate study of men all through the gamut of human qualities, from those who are held in prisons to those who dwell in palaces; for he knew the profit as well as the difficulty of such study, and he regretted that the segregating action of a highly developed social order should require men commonly to know only those who are of about their own grade. "Personally," he wrote, "I value what I have been so fortunate as to gain of acquaintance with very diverse sorts of men more highly than all else that I have won in the way of knowledge." That is a summary of Shaler's life-work in his own words. It is a happiness to know that he thus valued what he gained from others, for so we all, officers, students and friends of the university, and countless others in the great outer world besides, may feel that we made some return for the great gain that we have had in knowing him.

SCIENTIFIC BOOKS.

Dr. J. Frick's Physical Technique. Seventh edition. By Dr. Otto Lehmann. Vieweg, Brunswick. 1905. Vol. I., Part II.

This publication completes Volume I. of the seventh edition of this well-known work, the first part of which was reviewed in this magazine (Volume XX., p. 670, 1904). This second part of the first volume contains exactly 1,000 pages and is enriched by nearly 2,000 illustrations.

The first part of this first volume was devoted largely to a description of the necessary equipment of a physical laboratory, together with a description in detail of various technical processes such as soldering, glass blowing, construction of delicate apparatus, etc. This second part begins with an 'introduction to physical demonstrations,' which is followed by twelve chapters devoted to the various subdivisions of mechanics and heat.

In the introduction the author begins by stating what he considers to be the object of physics, and by describing the method followed by him in presenting the matter to his classes. The first subject treated, therefore, is that of forces, which is followed by a description of the meaning of units of length, time and mass, each of these being accompanied by rather elaborate descriptions of the best methods of making measurements. Without going into details, it may be interesting to state the order in which the subjects of physics are taken up. These are as follows: statics, solid bodies, hydrostatics, fluids, aerostatics, gases, temperature, quantity of heat, dynamics, hydrodynamics, aerodynamics, thermodynamics. Under the head of each of these, lecture experiments are described in full, which are designed to illustrate the varied phenomena and at the same time to enable measurements of the various quantities to be made on a large scale before the classes. The author attempts to give in each case information concerning the experiments and apparatus, so that, if a laboratory is not equipped with the apparatus as furnished by the large commercial houses, it is possible for the instructor himself to make simple and accurate apparatus. In some respects the book is a most admirable text-book for classes, and no one can read it without gaining much information in regard to both the theoretical and the practical side of the subject.

One has only words of praise to say of the object of the work, of the manner in which this has been carried out by the author, and of the admirable spirit in which the publisher

has fulfilled his share of the work. It must be confessed, however, that one misses in every chapter, almost on every page, a reference to the work which has been done on similar lines by the famous teachers and lecturers of England and America. It is doubtless true that the apparatus described in this book is that most generally available for German teachers; but in countless cases various improvements made by lecturers of other countries would be of great advantage in the teaching of physics in German institutions.

Müller-Pouillet, Lehrbuch der Physik. Edited by LEOPOLD PFAUNDLER. Tenth edition. Volume I. Vieweg, Brunswick. 1905.

In this tenth edition of this well-known standard book on physics, the editor has received the cooperation, in various chapters, of Lummer, Wassmuth, Perntner, Drucker, Kaufmann and Nippoldt, and undoubtedly the entire work when it is published will be much more complete than in the past. In the volume before us, which is devoted to 'Mechanics and Acoustics,' the number of pages and number of illustrations are less than in the previous edition; but the size of the pages has been enlarged, and the illustrations are all that could be desired. The book is designed not specially for students of physics, but for students of natural history, medicine and pharmacy as well, and also for use by makers and designers of physical apparatus. It fulfils its purpose admirably, giving many interesting details in regard to the construction of the apparatus and the theory of the experiments.

In this first volume it is impossible to give unlimited praise, owing to the almost complete absence of reference to the work of English students, and also to the fact that so few references are given to recent work. To a student who wishes to become acquainted with the main phenomena of physics, and who is not specially interested in the most recent theories, this volume will prove most valuable. The former edition of this treatise on physics has long filled a place of its own in all libraries, and it is undoubtedly true that the present edition will be even more acceptable.

J. S. AMES.

SCIENTIFIC JOURNALS AND ARTICLES.

THE May number of the *Journal of Nervous and Mental Disease* opens with a study of cerebellar tumors and their treatment by Drs. J. J. Putnam and G. A. Waterman. A number of operations for the relief of such tumors are reported, in three of which the results were decidedly satisfactory. Dr. E. B. Angell contributes a paper on hypesthesia and hypalgesia and their significance in functional nervous disturbances, and under the title, 'The Coming of Psychasthenia' Dr. Blumer discusses the importance of nomenclature in nervous and mental disease and advocates the adoption of Janet's 'Psychasthenia.'

THE first attempt to list and classify the Diptera of Minnesota has been made this year in the shape of the Annual Report of the Minnesota State Entomologist. The report is illustrated with drawings of various species of flies and two excellent colored plates. Since this work has come from the press seventy-five additional species have been collected within the boundaries of the state. These have been named and listed, and sent to entomologists and others likely to be interested. Any one who has not already received the report and the appendix who desires them can obtain the same by writing to Mr. F. L. Washburn, State Experiment Station, St. Anthony Park, Minn. Cloth-bound report requires eight cents for postage, paper-bound copies six cents.

THE Gebrüder Borntträger, of Halle, announce the publication of a *Zeitschrift für Gletcherkunde,* which is to be the organ of International Glacier Commission and will be edited by Professor Edouard Brückner, of the University of Halle. The journal will appear at irregular intervals, the subscription price being sixteen Marks for a volume of five numbers.

SOCIETIES AND ACADEMIES.

THE TORREY BOTANICAL CLUB.

THE club met on April 25 in the museum building at the New York Botanical Garden. President Rusby presided and there was an attendance of sixteen.

Notice of the coming botanical symposium to be held from July 2 to 9, 1906, at Mountain Lodge, Little Moose Lake, Old Forge, N. Y., was read.

Mr. H. A. Gleason presented a paper illustrated by many photographs, on 'Some Phytogeographical Features of the Prairies.'

An eastern extension of the great western prairies reaches across Iowa into Illinois and Indiana and portions of the adjoining states. Its flora is characterized by large numbers of western plants, although a majority of the species are of eastern distribution and constitute a derived element of the flora. The origin of the prairies has been referred to the character of the soil, the distribution and amount of rainfall, the direction of the prevailing winds, the grazing of bison and to forest fires. Each of these has probably had some influence in accelerating or retarding the invasion of the prairie or forest after the retreat of the continental ice sheet, but the most important factor of all is historical rather than physical in nature. At the close of the glacial period the territory since occupied by prairies was opened first to invasion from the southwest, a region of climatic prairies, and subsequently to invasion from the climatic forests of the southeast. The two floras, on meeting, adjusted themselves to each other and to the physical factors of the environment, so that the forests occupied the bluffs and valleys along the streams, and the prairies the high lands between them. The climate and soil were adapted to the growth of the forest, so that, until extensive cultivation was begun, the prairie was gradually being displaced.

A comparatively restricted area along the Illinois River is occupied by sand deposits covered with a vegetation essentially similar to that of the sand-hill region of Nebraska, and entirely different from that of the dunes at the head of Lake Michigan.

After an interesting discussion of Mr. Gleason's paper, Dr. Rusby exhibited various plants used as food by the Indians. Among these were young shoots of the cat-tail, specimens of bitter-root used by the Indians of the northwest, and Kouse—which consists of several species of *Lomatium* (*L. Canbyi* and *L. Kous*) and is an important article of Indian diet. Dr. Rusby also spoke of the use by the Indians of the young buds of the beech tree, which are edible, when cooked, at any date after the first of January.

Dr. N. L. Britton exhibited fruits of the palm *Acrocomia media* Cook, recently collected by him in Porto Rico,, and remarked on the relationships and distribution of this species, referring to the fine specimen of the plant growing in the palm collections of the garden, brought by Mr. Percy Wilson from that island several years ago. He stated that his observations on this tree showed that the trunk does not invariably bulge above the base as thought by Mr. Cook at the time he described the species (*Bull. Torrey Club,* 28: 566), a small proportion of the trees being quite columnar from the base up. He further reported that the *Acrocomia* of St. Kitts, collected by Mr. Cowell and himself in 1901 is identical with the Porto Rico species, and that it also occurs on the French Antilles, as illustrated by specimens received from Père Duss. The tree is altogether different from the spindle-shaped *Acrocomia fusiformis* of Cuba, and seems to be more closely related to the Jamaican *A. aculeata.*

C. Stuart Gager,
Secretary.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

The 617th meeting was held on April 7, 1906, with President Abbe in the chair.

Mr. W. D. Lambert presented 'A Generalized Trigonometric Solution of the Cubic.'

In the trigonometric solution of the cubic each case is solved by a device peculiar to itself. If an attempt is made to apply any method to a case for which it is not intended the angles corresponding to the trigonometric functions become complex or imaginary. If, however, we have a means of calculating these angles from tables of trigonometric and hyperbolic functions the method could be generalized, and would apply even when the coefficients are complex. Expressions—not new, but not generally known—for the angle corresponding to a complex sine were deduced. By the use of these, the method heretofore

confined to the 'irreducible case' will apply to all cubics, and for numerical calculation this process is as short as any other trigonometric solution, and has the advantages of a uniform procedure. If, in order to use only trigonometric functions, we introduce the auxiliary Gudermannian angle to calculate the hyperbolic functions that occur, the formulas reduce, in the case of real coefficients, to the ones commonly given for cases other than the irreducible.

Mr. A. Press spoke by invitation on 'Some Problems in Electrical Design.'

The question of heat-flow and temperature-rise was dealt with for the direct-current dynamo, the alternater, turbo-alternater and induction motor. It was shown that each type of machine comprises an entirely different physical problem, and that the enormous discrepancies between ordinary theory and practise rested on an incomplete application of Fourier's theorem of conservation of heat-flow. The closed types of machines were also pointed out as again offering a new series of problems.

With respect to sound problems of dynamo electric apparatus very little work had been done, although a satisfactory theory of these phenomena would be greatly welcomed by the engineering profession. In all probability there were radial vibrations set up in the laminæ of the cores, and, by virtue of the alternating character of the air-flow stream lines in the cores, sounds induced thereby superimposed upon the other sounds gave the chief characteristic difference between the kind of note emitted by the alternating types of machines and that by direct current types. There were problems of air-flow that also needed elucidation. These latter had intimate relationship with temperature-rise problems. The method of attack in factory work has necessarily to be modified in accordance with whatever tests have already been made, rather than have the experiments made to comply with some preconceived plan. In consequence of this the physical constants may be very wide of the truth.

Problems dealing with the determination of self-induction and resistance for very high frequencies (2,000 per second) had also to be attacked. As far as known only two types of conductor-arrangements have been completely solved. They are, respectively, the round conductor in free air and the rectangular conductor surrounded on three sides by iron. Frictional problems were also discussed, air friction and bearing friction being more specifically dealt with.

This paper led to an interesting discussion, especially with respect to the relative contributions made by the theoretical students of electricity and the constructors of machinery.

Informally Mr. White spoke of the galvanometer as a motor.

THE meeting falling due on April 21 was omitted on account of the meeting on April 20 and 21 of the American Physical Society. A luncheon was served by the Philosophical Society on Saturday at the Bureau of Standards, and in the evening a dinner in honor of Professor H. A. Lorentz, of Leyden, was attended by about fifty persons. Vice-president Bauer presided and Professor Newcomb was toastmaster.

THE 618th meeting was held on May 5, 1906.

It was announced that the society had accepted an invitation to be represented at the semicentennial celebration of the St. Louis Academy of Sciences on March 10, and had appointed Dr. W J McGee to represent it; a brief report from him was read and the medal sent by the academy was exhibited. Also the invitation to be represented at the bicentennial Franklin celebration in Philadelphia on April 18–20 had been accepted and the president had been appointed in response to it; he made an oral report.

Mr. W. J. Humphreys described some 'Recent Experiments on Arc Spectra under Heavy Pressures.' The Zeeman effect leads to the conclusion that an atom must have a magnetic field; therefore, a change in pressure should cause a change in the spectrum. The older experiments with high pressures were very unsatisfactory, being tedious and the arc unsteady. The speaker used a steel bomb, with a quartz window and a rotating electrode, and

a Rowland concave grating with photographic appliances; the work was comparatively rapid and the results highly accurate. Nearly all the metals had been used. The displacement of the lines toward the red as the pressure increased came out very clearly in the lantern slides and the magnitude of the shift was stated to be related to the periodic law.

Mr. N. E. Dorsey discussed 'A Possible Relation connecting Surface Tension, Molecular Weight and Dielectric Constant.' He pointed out that KM^2T/D^2 is of the same order of magnitude for all the liquids for which sufficient data are obtainable, and gave reasons for suspecting that such should be the case. Here K = dielectric constant, T = surface tension, M = molecular weight and D = density.

The president presented informally the unsolved physical problem of the formation of hailstones.

CHARLES K. WEAD,
Secretary.

THE ELISHA MITCHELL SCIENTIFIC SOCIETY OF THE UNIVERSITY OF NORTH CAROLINA.

THE 164th meeting was held on Tuesday evening, March 13, at 7:30 o'clock. Dr. F. P. Venable, president of the university, addressed the society on 'The Progress of Chemical Research in the United States.' Dr. Venable gave this address recently in New Orleans before the American Chemical Society as its retiring president.

The 165th meeting was held on Tuesday evening, April 10, at 7:30 o'clock. Professor William Cain, professor of mathematics and a civil engineer, gave the society a most interesting account of 'The Panama Canal.'

The 166th meeting was held on Tuesday evening, May 8, at 7:30 o'clock. The following papers were given:

MR. N. C. CURTIS: 'An Architectural Scheme for the University Buildings.'

PROFESSOR C. H. HERTY: 'Recent Work in Osmosis.'

A. S. WHEELER,
Recording Secretary.

THE MISSOURI SOCIETY OF TEACHERS OF MATHEMATICS AND SCIENCE.

THE second annual meeting of the Missouri Society of Teachers of Mathematics was held in Columbia, Mo., May 5, 1906. This society was organized a little over a year ago exclusively for teachers of mathematics. In response to the request of many teachers of science steps were taken which resulted in the adoption at the last meeting of amendments to the constitution, enlarging the scope of the society so as to include teachers of science, and providing for meetings of a division of mathematics and a division of science in addition to joint meetings. Provision was made to send delegates to cooperate in the completion of the organization of a national society. A committee was appointed to cooperate with committees from similar societies to discuss matters relating to instruction in elementary physics.

The program of the day consisted of a business meeting and a forenoon and afternoon meeting of each of the two divisions. Mr. H. C. Harvey, of Kirksville, presided at the business meeting and at the division of mathematics. Mr. F. N. Peters presided at the division of science. Mr. J. W. Withers was elected president for the coming year. In addition to individual papers in each division, a round-table discussion of the teaching of elementary algebra was held which was participated in also by a number of teachers of physics. On the whole, a very encouraging interest was manifested in the work of the society.

A complete program and abstracts of the papers presented will be published in *School Science and Mathematics*, the official organ of the society.

L. D. AMES,
Secretary.

DISCUSSION AND CORRESPONDENCE.

A PLEA TO MAKE THE SMITHSONIAN INSTITUTION A NATIONAL INSTITUTE OF RESEARCH.

THERE is great need in this country to-day of a place where advanced investigators can go, as they can to the great German universities, and carry out researches in an atmosphere of investigation, such as is only created by the friction of young and vigorous but trained intellects.

In our universities the pedagogic element is

predominant to a degree quite unknown in the German university and the body of investigators in them in any one field is too small to create that which is the most stimulating thing in all research—an atmosphere of investigation.

I venture to say that there is not a single American investigator who has occupied one of the tables of the Smithsonian Institution at Naples (in that wonderful research laboratory of the Biological Station) who will not bear me out when I state that the stimulus of research of that institution comes from the contact that is there encouraged between the investigators of all Europe.

Any institution composed only of a number of men with fixed salaries will gradually become conservative and cease to be productive of great results. It is the young men with the spur of ambition and necessity that create new things in science.

Why not recognize this great factor and do for science what West Point has done for the army? Let the Smithsonian Institution start the movement and get together from the various states a hundred picked men who do not want to be taught but each one of whom has an idea of his own that he is anxious to work out in an atmosphere that is stimulating to research, and where he can be in close touch with other minds that are interested in similar lines of work or at least are broad enough to grasp the importance of the problem that he is absorbed in.

Spend all the money necessary in the selection of these men. Organize the machinery by which this selection is done and, if it is advisable, apportion them out among the different states and make the senators responsible for those from their states. Have each applicant present a definite problem to be solved and in addition, by references and examination, if necessary, show his fitness to hold a table in the institution. In addition, appoint a committee that shall make a study of each applicant proposed for admission and let their decision as to the man's fitness for the place be final. Give this committee every facility to study the problem of selecting men who have the sacred fire of the investigator in them.

Have each table fully equipped with all the necessary apparatus and give to each state investigator a sum of money each year that he can live on comfortably.

Fix the terms of occupancy of the tables at two years, but give to the board of directors the right to retain for two years longer such men as in their estimation have shown marked ability or whose researches are of sufficient promise though not completed to warrant a longer stay.

Get men of prominence in the various lines of research as permanent investigators, with the understanding that they are not to be teachers but will be given the means with which to carry on their investigations, at the same time imposing on them the work of keeping up the spirit of the institution, and assisting in the details of its administration by means of board meetings just as colleges are managed.

Divorce from the Smithsonian Institution the museum idea. Create a separate office to have charge of the collections and the expositions of applied science and put in this office a man whose tastes are those of an administrator.

Once separate, the Smithsonian Institution proper should become the great national institute of research and to be at its head should be a compliment not only to scientific accomplishment but to one's devotion to the great spirit of discovery.

The man for the head of an institution of research such as I have described would be one preeminent in his line of work but in addition, like the great Ostwald, of Leipzig, a believer in the great value of free laboratory discussion.

DAVID FAIRCHILD.
U. S. DEPARTMENT OF AGRICULTURE.

SPECIAL ARTICLES.

A MACHINE FOR COMPOUNDING SINE CURVES.[1]

THE instrument about to be described was designed primarily for use in a class in alternating currents. It has proved itself well

[1] Presented before the American Physical Society, February 24, 1906.

adapted for this purpose, and might perhaps also be employed to advantage in illustrating some of the wave-forms that occur in other branches of physics. It does not compound simultaneously a large number of curves of different periods, as does the machine of Mach,[2] Michelson's harmonic analyzer,[3] or the arrangement recently devised by Lord Rayleigh for illustrating the nature of white light.[4] It is, however, capable of drawing accurately the resultant of a fundamental sine curve and either its second, third or fifth harmonic, and can be quickly adjusted to give any desired amplitude and phase relation. The curves are large enough to be seen distinctly from all parts of a good-sized lecture room. The whole instrument is very compact and easily portable. Much praise is due to Mr. F. H. J. Newton, the college mechanician, for the skill with which he has carried out the details of construction.

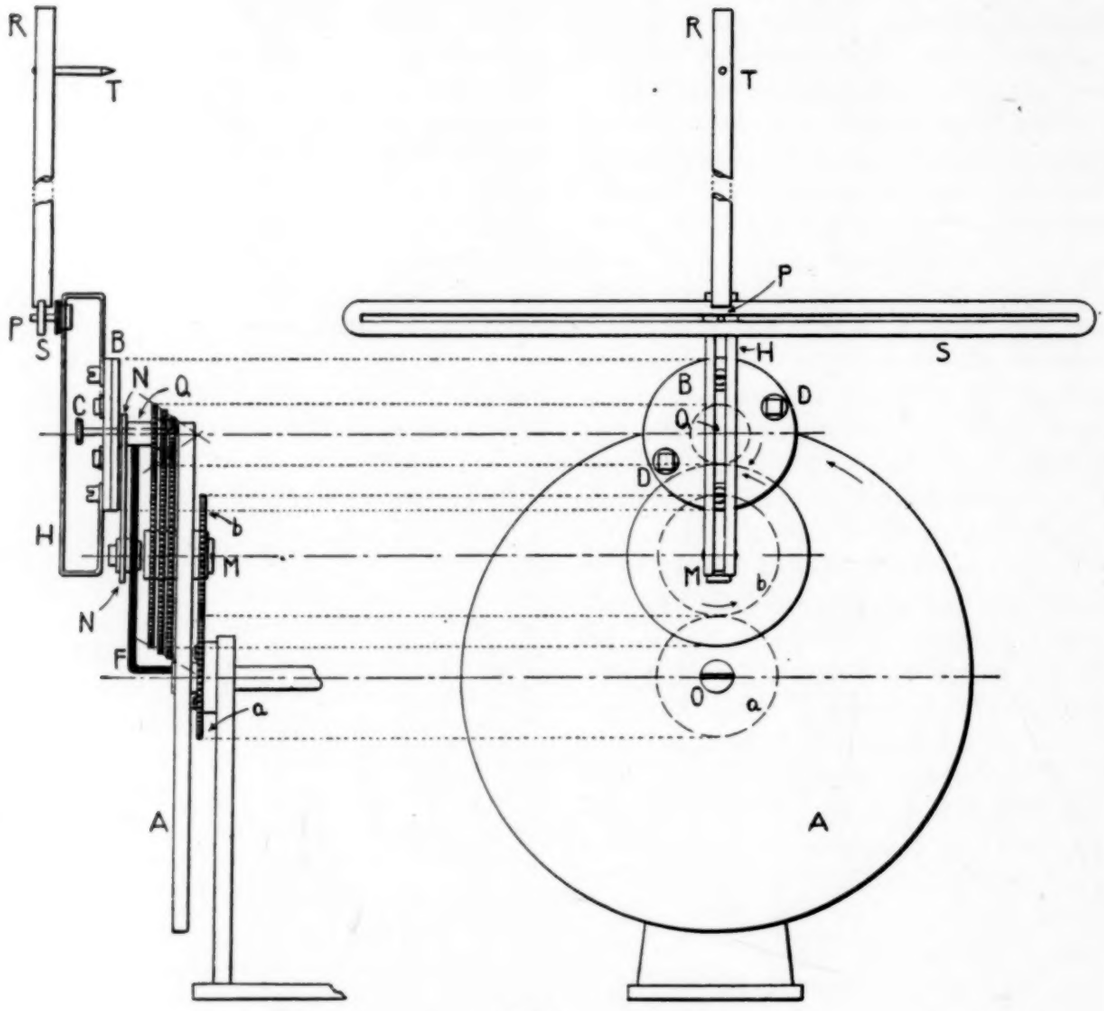

Fig. 1.

Fig. 1 shows front and side elevations of the instrument, somewhat simplified for clearness. Fig. 2 is from a photograph of the entire instrument. The lettering is identical in both figures.

A hard rubber disc *A* 21 cm. in diameter, mounted at the end of a horizontal shaft, carries a smaller disc *B*, to which a short pin

[2] *Pogg. Ann.*, 129, p. 464, 1866.

[3] A brief description of the harmonic analyzer is given in Michelson's 'Light Waves and their Uses.'

[4] *Phil. Mag.*, 11, p. 127, January, 1906.

P is attached. P fits in a slot in a movable horizontal bar S, to which is rigidly attached the vertical rod R. The latter slides up and down inside a slotted tube U (Fig. 2), so that the vertical component of the motion of P is transmitted to a pencil mounted on R at T. A large gear wheel G mounted on the shaft O (Fig. 2) engages in a rack on the under

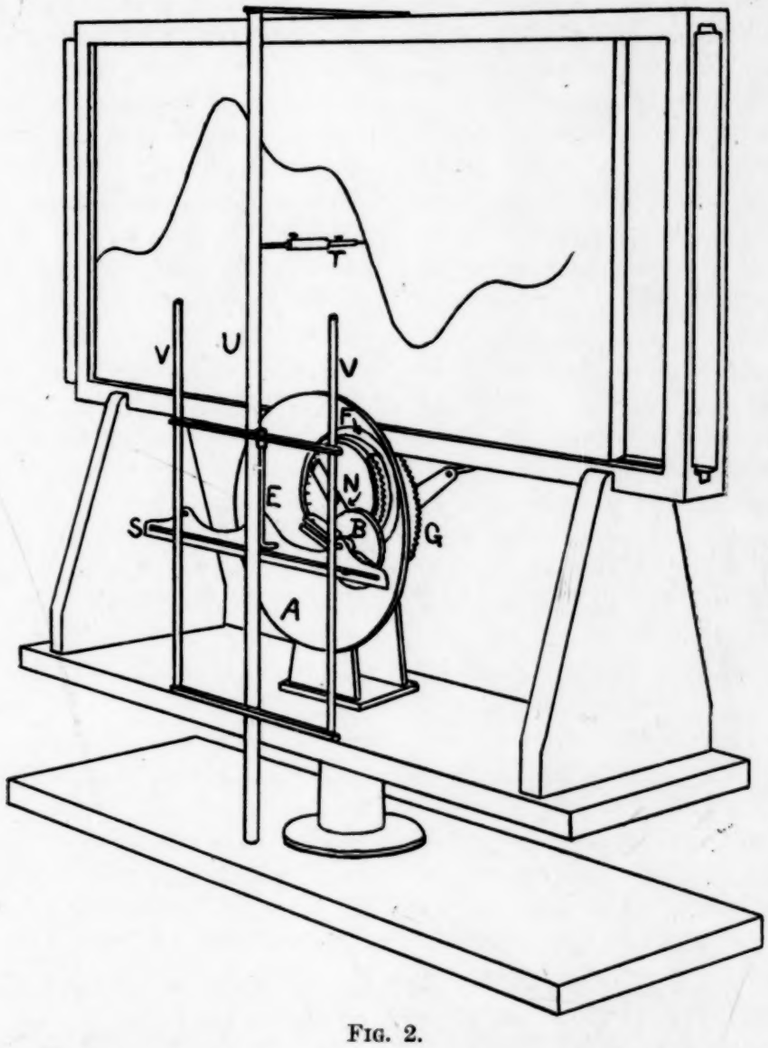

FIG. 2.

edge of a vertical board, 66 x 31 cm., to which a sheet of paper is fastened. When the shaft is turned by means of a crank, the board is advanced horizontally between wooden guides and the pencil T traces a curve, whose form depends upon the setting of the discs A and B.

By means of gearing to be described presently, the disc B can be made to rotate either two, three or five times for each revolution of A. If the pin P is set so as to lie in the axis Q, around which B rotates, the fundamental curve of amplitude OQ will be traced. For any other position of P, the second, third or fifth harmonic, of amplitude PQ, is superposed upon the fundamental curve. When the disc B is shifted so as to make the distance OQ equal to zero, the harmonic alone is drawn. Any phase relation can be produced between the fundamental curve and its harmonic.

Fig. 1 shows the train of gear wheels that rotate the disc B. a represents a stationary two-inch (5.08 cm. diameter) gear wheel screwed to the bearing through which the shaft O passes. The teeth of this wheel engage those of a second gear wheel b of the

same size, which is rigidly attached to a short shaft M passing through the disc A. At the other side of A are mounted side by side on this shaft three gear wheels, of pitch diameters 7.62, 8.12 and 8.71 cm., respectively. These engage three smaller wheels, of diameters 2.54, 2.03 and 1.45 cm., which are mounted loosely on the shaft Q of the disc B. A pin C fitting in a longitudinal slot cut in this shaft can be thrust in or pulled out, so as to lock any one of the three small gears on to the shaft. In the front elevation (Fig. 1) only one of the three pairs of gears is represented. When the disc A is rotated, the gear b rolls around on a, and, as is seen from the relative diameters of the two sets of gears mentioned above, the disc B is caused to rotate two, three or five times for each turn of A, according to the setting of pin C.

The shaft Q is carried by the arm NN, which can be swung around M as a center and clamped so as to give to the distance OQ any desired value from zero to twice OM. NN is clamped to the brass plate F, which is screwed to the disc A and is so shaped as to bridge over the gear wheels, bringing the axis of NN in line with the axis M. The plate F is partly visible in Fig. 2. It will be noticed that the sizes of the three concentric gears on shaft Q, and of the three corresponding gears on shaft M, are such that MQ is 5.08 cm., the same as OM. The period of the fundamental curve is represented by a distance of 48 cm. on the paper.

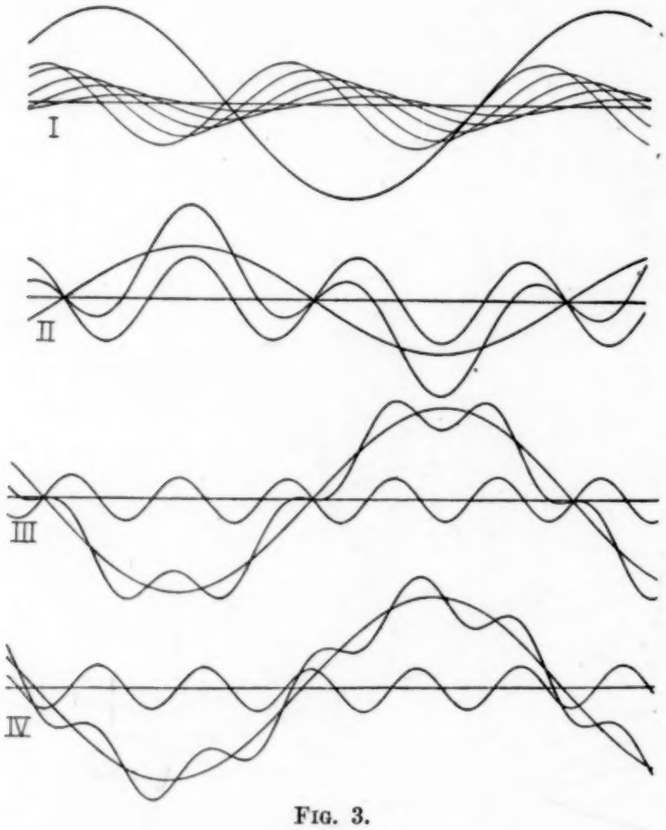

Fig. 3.

The pin P, instead of being attached directly to the disc B, is held by a small brass block that slides in a groove on the bridge H which spans the disc. Space is left below this bridge for the pin that locks the gears on shaft Q, and the pin P can readily be clamped so as to give to the harmonic wave any amplitude up to 8 cm. The bridge is provided with a set of graduations. To adjust the phase of the harmonic, it is only necessary to loosen

two screws *DD* on the disc *B*, when the bridge can be swung around on *Q* as a center as far as is desired.

To aid in setting the amplitude of the fundamental curve, a series of graduations is provided on a disc carried by the swinging arm *N*, which enables the distance *OQ* to be read off directly (see Fig. 2). Before a curve is drawn, the disc *A* may be rotated so as to begin with any desired phase of the fundamental. Great care has been taken to avoid unnecessary backlash on the part of the various gears, so that the curves are practically free from any irregularity due to this cause.

The two side posts marked *V* in Fig. 2 serve as guides to keep the bar *S* parallel to the paper. The bent rod *E* can be swung around so as to hold *S* in its mean position. A base-line can then be drawn by simply sliding the board along without rotating the discs. In drawing curves before a class, the lecturer stands behind the instrument. For ease in making adjustments, the machine is mounted on a swivel, so that it can be rotated about a vertical axis, adjusted and turned to face the class again. A pencil of soft graphite is most convenient for drawing curves, though a pen can be used. The curves reproduced in Fig. 3 were obtained directly with pens made from glass tubing.

In Fig. 3 I. represents a group of second harmonics of various amplitudes and phases. Any one of these might, of course, be combined with the fundamental curve. In II. the third harmonic is drawn alone, then compounded with the fundamental; and in III. and IV. similar curves for the fifth harmonic are seen.

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QUOTATIONS.

THE TEACHING PROFESSION.

No greater evil could befall the educational system of this country than that of becoming definitely crystallized into the type of organization exemplified by mercantile and corporate enterprise. The evil is imminent, and sometimes seems inevitable, so pervasive are the influences that tend to make educational administration a matter of business, and so persuasive is the argument from analogy when addressed to ears predisposed by every familiar association to accept its validity. Material and commercial modes of thinking prevail so largely in our national consciousness, and impose themselves so masterfully upon our narrowed imagination, that most people are ready to accept without hesitation their extension into the domain of our intellectual concerns, particularly into that of the great concern of education. Why, it is naïvely asked, why should not the methods that we apply with such pronounced success to the management of a bank or a railway prove equally efficient in the management of a system of schools or a university? Why should there not result from their employment here the same sort of efficiency that results from their employment elsewhere? Why should not the educational fruits of autocratic control, centralized administration and the hierarchical gradation of responsibility and authority be similar to their fruits in the field of commercial activity?

These questions are not difficult to answer, but it is difficult to frame the answer in terms that the successful man of affairs will find intelligible. The subject is one that he approaches with a prejudiced mind, although his bias is not so much due to perversity as to sheer inability to realize the fundamental nature of the question at issue. He is so fixed in the commercial way of looking at organized enterprise that he can not so shift his bearings as to occupy, even temporarily, the professional point of view. Now the idea of professionalism lies at the very core of educational endeavor, and whoever engages in educational work fails of his purpose in just so far as he fails to assert the inherent prerogatives of his calling. He becomes a hireling, in fact if not in name, when he suffers, unprotesting, the deprivation of all initiative, and contentedly plays the part of a cog in a mechanism whose motions are controlled from without. Yet the tendency in our country is to-day strongly set toward the recognition of this devitalized system of educational activity as suitable and praiseworthy, and the

spirit of professionalism in teaching is engaged in what is nothing less than a life-and-death struggle. When a university president or a school principal can indulge unrebuked in the insufferable arrogance of such an expression as 'my faculty' or 'one of my teachers,' when school trustees are capable of calling superintendents and principals and teachers 'employees,' it is time to consider the matter somewhat seriously, and to inquire into the probable consequences of so gross a misconception of the nature of educational service.

There is one general consequence which subsumes all the others. It is that young men of character and self-respect will refuse to engage in the work of teaching (except as a makeshift) as long as the authorities in charge of education remain blind to the professional character of the occupation, and deal with those engaged in it as objects of suspicion, or, at best, as irresponsible and unpractical theorists whose actions must be kept constantly under control and restricted by all manner of limitations and petty regulations. Membership in a profession implies a certain franchise, an emancipation from dictation, and a degree of liberty in the exercise of judgment, which most members of the teaching profession find are denied them by the prevalent forms of educational organization. And the denial is made the more exasperating by the consciousness that these rights (which are elementary and should be inalienable) are withheld by persons whose tenure of authority is more apt to be based upon the executive energy or the ability of the schemer or the success of the man of practical affairs than upon expert acquaintance with the conditions of educational work. The 'business' president or administrative board is bad enough, and the 'political' president or board is worse; yet upon the anything but tender mercies of the one or the other most men who devote their lives to the noble work of teaching must in large measure depend.

The inevitable consequence of this condition is, as we have said, that a process of natural selection is constantly tending to drive the most capable men into professions which may be pursued upon professional terms, and to make the teaching profession more and more the resort of the poor in spirit, to whom the words of the Beatitude must have a distinctly ironical ring. To become a teacher in this country is, except in the case of a few favored institutions or systems, to subordinate one's individuality to a mechanism, and to expose one's self-respect to indignities of a peculiarly wanton sort. It is no wonder that the young man of parts is not over-anxious to enter a profession so forbidding to every professional instinct, and that he turns aside from the educational field, however strong his natural inclination to enter it, when he gets sight of the artificial obstacles to its proper cultivation.

It is often urged that the money rewards of the teaching profession are insufficient to attract to it the better class of men. This is undoubtedly true up to a certain point, but to insist upon it overmuch is to take a more cynical view of human nature than we are willing to take. Inadequate compensation is a grievous fault of our educational provision, but it is not so grievous as the faults that undermine professional self-respect, and sap educational vitality at its very root. Yet these graver faults are easily remediable, and would be promptly remedied if we could once rid ourselves of the obsession of the commercial or military type of administrative organization. If the educational laborer is worthy of his hire, he is even more worthy of the trust and confidence that necessarily appertain to his delicate and specialized duties, and to refuse him these is to degrade his effort into the mere journeyman's task. The whole question of the relative importance of compensation and consideration was thus stated by one of the speakers at the Illinois Trustees' Conference of last October: "Young men of power and ambition scorn what should be reckoned the noblest of professions, not because that profession condemns them to poverty, but because it dooms them to a sort of servitude. * * * The problem is not one of wages; for no university can become rich

enough to buy the independence of any man who is really worth purchasing."

The more closely the business analogy is examined the more apparent is its failure to fit the conditions of education. Efficiency in business is achieved by the subordination of individual initiative to centralized direction. A highly capable manager makes all the plans, and transmits his ideas, through his heads of departments, to the host of workers, who are expected to do exactly as they are told. Now this arrangement, entirely proper in a department store or a railway company, becomes almost worthless when fitted to a university or a system of public schools, for here the one essential factor of success is that the teachers, who are in this case the host of workers, should be left unhampered by specific directions, and free to apply their own specialized intelligence to their work. Every attempt to shape that work from above, except in such mechanical or formal matters as the allotment of duties and the arrangement of programs, especially every attempt to impose tests or dictate concerning methods, is likely to work direct injury, and is certain in time to eliminate from the body of workers the very persons whom it is most desirable to retain. For it can not be said too often or too emphatically that teaching is the personal concern of instructor and student, and that any meddling with this delicate and intimate relation will work much more mischief than good. So the commercial ideal of high-priced imperious management and low-priced docile labor can have no place in educational work, where the ideal should be rather that of cordial cooperation between all the forces engaged, with the distinct admission that educational policy (as far as such a thing is found desirable) must proceed from the established teaching relation rather than from the doctrinaire mandate of the executive theorist.

We know very well the clamorous objections that will be raised against the fundamental propositions above outlined. 'Chaos is come again' will be the outcry whenever education is sought to be rearranged upon these conditions. To such rigidity of mind have the majority of educational leaders been reduced by the ideal of regimentation and the fetich-worship of system and uniformity that they are honestly incapable of realizing the individualist attitude or of sympathizing with the more humane and rational principles which we have endeavored to set forth. Jealous enough of professional privilege on their own account, they take a slighting view of the equally valid claims to professional consideration made by the body of actual teachers. They are so impressed by their smoothly-working machinery as to forget completely that the fashioning of souls is a very different affair from the manufacture of watches or other products of the mechanic arts. To their view, the alternative offered in place of their elaborate systems of executive control and the graded devolution of authority may well seem to deserve the name of chaos, but intelligent minds will not be terrified by a word which means, in this instance and in the last analysis, nothing more than a recognition of the fact that teachers and students are alike individuals, and that prescription *en masse* is the poorest possible way of dealing with difficulties that concern individuals alone.

Aside from the cry of chaos, every plea for the rehabilitation of the teaching profession is sure to be met by the assertion that large numbers of those engaged in it are unfit for the burden of professional responsibility. This is probably true. It would be surprising if it were not true, when we consider the meagerness of the rewards hitherto held out to the rank and file of the profession, and the constant growth of the regulative tendency which unfailingly operates to deter the best men from becoming teachers, and to drive from the ranks the best of those already enlisted. The situation, moreover, as respects the sort of ability, the type of outstanding personality, most to be desired, tends constantly to grow worse rather than better through the continuous operation of the same malign influences. But was there ever a more vicious circle of argument than that which defends the persistence in a system productive of such unfortunate results by urging that the personnel of the profession has now been brought so low that the restoration of its in-

herent rights would entail disastrous consequences? Very possibly it would, and evils of this sort might have to be faced, but they would be in their nature temporary, and not nearly as disheartening as the lasting and deepening evils involved in the perpetuation of an administrative policy which is an affront to every professional instinct. Professor Joseph Jastrow, in a remarkably forceful and enlightened discussion of this subject in its bearings upon university administration (SCIENCE, April 13), puts the whole matter in a nutshell when he declares for the substitution of 'government by cooperation' for 'government by imposition.' This is surely the ideal toward which everyone having at heart the interests of education as a professional matter should strive, in fields both high and low, and we have observed numerous recent indications of a reaction in this sense from the military or corporate ideal which has hitherto had things its own way. But the enemy is still strongly intrenched, and his position will not easily be forced.—*The Dial.*

THE GEOLOGICAL SURVEY.

THE National Geological Survey has properly taken alarm at the radical cut which Mr. Tawney, the new chairman of the House committee, has made in the appropriation for its work. He proposes to reduce the annual charge from $1,400,000 to $1,050,000, a cut which falls with especial severity upon certain of the survey's operations. The allowance for the measurement of streams for water-power purposes and to aid in settling other questions of municipal and domestic importance, in which New England is so vitally interested, has been cut from $200,000 to half that sum. The coal-testing plant at St. Louis, recently described in the *Transcript,* will be asked to get along on half rations. The division of mineral resources, and the Topographical Survey, have also felt the committee's pruning knife.

While it has long been evident that the Geological Survey was expanding far too rapidly, in common with various other functions of government, so radical a cut as this is neither necessary nor desirable. The survey has trained its own scientists for their various lines of work, and such a reduction as Mr. Tawney proposes would break up a corps that could not in years be reassembled. In view of the expenditures for war, like the $100,000,000 a year in time of profound peace, for the navy, it seems little short of ridiculous to be disturbed over a great civil establishment, whose work is counting for civilization and progress in a score of directions, at an annual cost which equals that of the navy for only four days. So long as the government can spend freely for some things, it seems unreasonable to hold other agencies down to the strict rules of economy. The survey is now moving vigorously to get the House or, if not that body, certainly the Senate, to restore its appropriation, in part, at least. Every new chairman of the appropriations committee makes a similar attempt. Mr. Cannon did, when he went into that service, and so did Mr. Hemenway, and now comes Mr. Tawney.

The national irrigation enterprise which is conducted by the Geological Survey, though not carried in its appropriations, is now at full tide. More ditch digging is probably in progress under its direction than at Panama, for the records show that the reclamation service is employing four thousand persons directly, and that the contractors working under it employ seven thousand more. Irrigation expenses have now reached one million dollars a month, paid for by the sales of public land, and at this rate expenditure will go on, it is safe to predict, for some years. These enterprises bring differing problems, and although no one of them is so difficult as that at Panama, they present in the aggregate questions to be solved, engineering, mechanical and financial, probably not less serious than at the Isthmus.—*The Boston Transcript.*

ASTRONOMICAL NOTES.

SUGGESTIONS FOR A THEORY OF THE MILKY WAY AND THE CLOUDS OF MAGELLAN.

MR. ARTHUR R. HINKS, of Cambridge, England, has published an interesting pamphlet on 'Suggestion for a Theory of the Milky

Way and the Clouds of Magellan.' Mr. Hinks contends, and we think with good reason, that the facts do not support the Spencerian view, that the stars and nebulæ are so definitely separated that they must be regarded as complementary parts of a general scheme, a view which implies the symmetrical condensation of stars upon the plane of the Milky Way, and of nebulæ toward its poles. The author suggests as a working hypothesis, that the stars are distributed in a series of more or less independent star clouds about the plane of the Milky Way, and the nebulæ (not gaseous), in a series of nebula clouds out of the Milky Way, but not symmetrically condensed toward its poles. The Small Magellanic Cloud becomes by this plan a distant star cloud, and the Large Magellanic Cloud, a combined star and nebula cloud. The theory of Mr. Hinks certainly seems to satisfy recent investigations in distribution better than older and more rigid schemes.

THE MAGELLANIC CLOUDS.

FROM many standpoints the Magellanic Clouds are unique. To the naked eye they appear as detached portions of the Milky Way, faint luminous clouds which disappear in full moonlight. By no means, however, should they be regarded as merely irregular extensions of the Milky Way. They have some striking peculiarities. The Milky Way is characterized by enormous numbers of faint stars and the absence of small nebulæ in general, especially spirals. It has been shown by Professor Pickering that the Milky Way is probably composed entirely of faint stars of the first type, together with the greater part of the stars of the fifth type, which are numerically unimportant. The type of spectrum of the faint stars of the clouds has not been determined, but it is noteworthy that all fifth-type stars not found in the Milky Way are in the Magellanic Clouds. The Small Cloud resembles the Milky Way in the large numbers of faint stars and in the presence of numerous clusters. It also contains few nebulæ, but one of these is a bright-spiral. It is strikingly different from the Milky Way in the presence of great numbers of variable stars, nearly 1,000 having been found on the Harvard plates. The Large Cloud shows less resemblance to the Milky Way. It is true that there are great numbers of faint stars, but also there are great numbers of faint nebulæ. These nebulæ, however, do not appear to be spiral on the Harvard photographs. Variable stars are numerous. These clouds apparently contain within themselves all the different elements of our universe, and may well be imagined to constitute independent galaxies, if such exist.

THE SOLAR ORIGIN OF TERRESTRIAL MAGNETIC DISTURBANCES.

IT has been believed for a long time that terrestrial magnetic phenomena were more or less intimately associated with the sun, but Mr. E. Walter Maunder, of the Royal Observatory at Greenwich, has discovered a new phase of the problem which marks an epoch in this department of solar and terrestrial physics. He has shown conclusively that not only are magnetic disturbances related to the sun, but also that they are related to the sun's rotation. From a study of magnetic phenomena, extending from 1848 to 1903, including 726 disturbances, he has pointed out that whenever a magnetic disturbance occurred when a given heliographic longitude was at the center of the sun's apparent disc, there was a tendency for another disturbance to follow after one revolution of the sun brought again the same longitude to the center. So much seems sure. Certain conclusions, also, follow from these observations:

1. That the sun's action, of whatever nature, is not from the sun as a whole, but from restricted areas.

2. That the sun's action is not radiated, but restricted in direction.

PHOTOMETRIC DETERMINATION OF THE STELLAR MAGNITUDE OF THE SUN.

IN A. N. No. 4065, M. Ceraski, director of the Astronomical Observatory of Moscow, gives the results of a new determination of the stellar magnitude of the sun. The mean value obtained is -26.59. M. Ceraski, however, objects to the use of the term *minus* for

stars whose brightness is greater than that corresponding to magnitude zero, and suggests instead the word *supermagnitude*. The sun, therefore, becomes 26.59 supermagnitude. This value is based upon the Potsdam magnitudes of Polaris, Alpha Canis Min., and Sirius, which are 2.15, 0.56 and —1.09. The corresponding Harvard magnitudes are 2.12, 0.48 and —1.58, the use of which would, of course, have led to slightly different results. The sun sends us about seventeen billion times as much light as Sirius, the brightest star in the heavens.

RECENT AND COMING TOTAL ECLIPSES OF THE SUN.

THE total eclipse of August 30, 1889, was in many respects a favorable one. Skilled observers from various countries took up stations at so many widely separated places along the belt of totality, that the phenomenon could not well escape them all. Although clouds prevented observations in Labrador, elsewhere—in Spain, Algeria and Egypt—observations and photographs were obtained, which should increase substantially our knowledge of the sun, when the results have been reduced and compared.

Professor David P. Todd and Mr. R. H. Baker, of the Amherst Observatory, have issued a pamphlet, calling attention to the next favorable eclipse. Although there will be six total eclipses during the next six years, that of January 13–14, 1907, seems to be most favorable. This eclipse, however, presents some difficulties, since the track of totality lies in Turkestan and Mongolia. Nevertheless, it will doubtless be observed by some enthusiastic astronomers. The duration of totality will be about two minutes.

S. I. BAILEY.

FLUID LENSES.

A REPORT from Consul-General W. A. Rublee, at Vienna, states that after experiments extending over a number of years a Hungarian chemist has succeeded in producing optical lenses by a simple and cheap process that are not only quite as good as the best massive glass lenses at present used, but that can be manufactured of a size three times as great as the largest homogeneous glass lens heretofore made.

The importance of this invention in the field of astronomy is obviously very considerable. The largest glass lens heretofore manufactured out of massive glass for astronomical purposes has a diameter of about 1.50 meters, and it required several years to make it, while the price was several hundred thousands of marks. Such a lens can be manufactured by the new process in a few weeks at a cost of 2,000 or 3,000 marks. The price of a glass lens of the best German manufacture, with a diameter of 25 centimeters, is now about 7,000 marks, whereas the price of a similar lens made by the new process is about 150 marks. Lenses of smaller diameter for photographic purposes, for opera glasses, reading glasses, etc., can be produced at correspondingly smaller cost. The lens consists of a fluid substance inclosed between two unusually hard glass surfaces, similar to watch crystals, in which the refractive power and other characteristic properties are so chosen that the glass surfaces not only serve to hold the fluid, but also combine with the fluid to overcome such defects as are scarcely to be avoided in ordinary lenses. It is for this reason also that the lens is achromatic.

The fluid contained in the lens is hermetically closed, so that no air can enter and exercise a damaging effect. The fluid does not evaporate, and its composition is such that its properties are not affected by time or by temperature. The coefficient of expansion, both of the glass and of the fluid, is approximately the same between the temperatures of 15 degrees of cold and 60 degrees of heat. Another advantage of the lens is that, on account of the fact that the fluid is not dense and the glass crystals are thin, the whole lens combination through which the light must penetrate is very slight.

These fluid lenses are already manufactured in Austria, and are attracting attention both on account of their utility and the small price at which they are sold. Patents have been taken out in other countries, and they are soon to be introduced.

THE INTERNATIONAL GEODETIC ASSOCIATION.

THE 15th general conference of the International Geodetic Association will meet in the hall of the Academy of Sciences at Budapest on September 20, 1906, and the following program has been arranged to cover the work of the conference:

1. Opening of the conference.
2. Report of the perpetual secretary.
3. The extension of the convention of 1895 for a new period of ten years.
4. The selection of a committee on finance.
5. The report of the director of the Central Bureau on the work of the bureau during the triennial period 1903–1906.
6. Report on the observations of latitude in the northern hemisphere.
7. Report on the observations of latitude in the southern hemisphere.
8. Discussion on the continuation of the observations of latitude.
9. Report of the Central Bureau on the determinations of gravity at sea and on the coasts.
10. General reports.
    (*a*) On triangulation.
    (*b*) On the measurement of base lines.
    (*c*) On leveling of precision.
    (*d*) On the measurement of tides.
    (*e*) On the determination of longitude, latitude and azimuth.
    (*f*) On deflections of the vertical.
    (*g*) On the determinations of gravity.
11. Presentation of national report.
12. Discussion of the following subjects proposed by the Association of Academies:
    (*a*) Levels of precision in mountain chains subject to earthquakes with a view of determining whether such mountain chains are stable or subject to movements either of elevation or depression.
    (*b*) Measures of the value of gravity for the purpose of throwing light on the internal distribution of terrestrial masses and on the rigidity or isostacy of the coast of the globe.
13. Program of the director of the Central Bureau for work to be undertaken during the following years.
14. Report of the committee on finance.
15. Estimate of expenses for the following years.
16. Election of a president, vice-president and perpetual secretary for a period of ten years.
17. Miscellaneous communications.

THE CONGRESS OF THE UNITED STATES.

May 21.—A bill to authorize the Secretary of Commerce and Labor to cooperate through the Bureau of the Coast and Geodetic Survey and the Bureau of Fisheries with the Shellfish Commissioners of the State of Maryland, in making surveys of the natural oyster beds, bars, rocks and waters within the State of Maryland, passed the Senate.

May 24.—The bill for the preservation of American antiquities passed the Senate.

May 28.—The resolution to prohibit the killing of wild birds and other wild animals in the District of Columbia passed the House.

May 28.—The bill incorporating the Archeological Institute of America was approved by the President.

The Honorable George M. Bowers was nominated for reappointment as Commissioner of Fish and Fisheries.

THE CALIFORNIA ACADEMY OF SCIENCES.

WE take pleasure in publishing a letter addressed by the Academy of Natural Sciences of Philadelphia to the California Academy of Sciences and resolutions adopted by the Botanical Society of Washington in commendation of the services of Miss Alice Eastwood:

THE ACADEMY OF NATURAL SCIENCES
OF
PHILADELPHIA.
LOGAN SQUARE.

May 31, 1906.

MR. J. O. B. GUNN,
Corresponding Secretary of the California Academy of Sciences:

Sir:—The Academy of Natural Sciences of Philadelphia, sympathizing with the California Academy of Sciences in the affliction resulting from earthquake and fire, as an evidence of appreciation of the work done for the advancement of knowledge during the last fifty-three years, and in admiration of the fine courage which does not succumb to a calamity of even such magnitude, desires to assist in the process of resurrection.

The council of this academy has, therefore, directed that, if required, as complete series as possible of its publications, together with a collection of duplicate books, be sent to the California Academy as a contribution toward the replacing of its library.

The proposed gift will consist of upwards of 1,800 volumes and will be forwarded on receipt of advice as to its acceptability and suggestion as to the best time and mode of transmission.

With hearty wishes for a brilliant future, I remain, on behalf of the Academy,

Yours sincerely,

EDWARD J. NOLAN,
Recorder of the Council.

WASHINGTON, D. C.
May 29, 1906.

Resolved, That the Botanical Society of Washington commends the scientific spirit and bravery shown by Miss Alice Eastwood in entering the partially wrecked academy building at San Francisco, California, at the time of the earthquake and fire, and saving the valuable types in the herbarium in the California Academy of Sciences. That we appreciate the forethought and wisdom of having the types previously segregated.

That the society sends personal congratulations and best wishes for the future of the academy.

Resolved, That a copy of Miss Eastwood's letter to Dr. Edward L. Greene, giving the details of this occurrence, be filed with these resolutions; and that a copy of these resolutions be sent to Miss Eastwood and to SCIENCE.

(Signed)

President, M. B. WAITE.
Vice-president, J. N. ROSE.
Recording Secretary, C. V. PIPER.
Corresponding Secretary, A. S. HITCHCOCK.
Treasurer, CARLETON R. BALL.

THE ITHACA MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

A SPECIAL summer meeting of the American Association for the Advancement of Science will be held in Ithaca, N. Y., June 28 to July 3, 1906, in the buildings of Cornell University. In affiliation with the association there will meet the American Physical Society, the American Chemical Society and the New York Section of the Society of Chemical Industry, the Society for the Promotion of Engineering Education, the American Microscopical Society and the American Fern Society.

GENERAL PROGRAM.

The program for the entire meeting will be issued on Friday, June 29. The following events may be announced in advance:

Thursday, June 28, 1906, at 10 A.M., the register for the Ithaca meeting will be open at the office of the permanent secretary, Ithaca Hotel.

At 12 M., the regular meeting of the executive committee of the council, consisting of the general secretary, the secretary of the council and the secretaries of the different sctions, will be held in the rooms of the permanent secretary, at the Ithaca Hotel.

At 8:30 P.M., informal smoker at the Town and Gown Club.

Friday, June 29, 1906, at 9 A.M., meeting of the council in the Ithaca Hotel.

At 10 A.M., first general session of the association in the Armory, Cornell University. The meeting will be called to order by the president of the association, Dr. W. H. Welch. Addresses of welcome will be delivered by Dr. J. G. Schurman, president of Cornell University, by Hon. Andrew D. White and by the mayor of Ithaca. Reply by President Welch. Announcements by the general, permanent and local secretaries. Agreement on the hours of meeting.

At 1 P.M., luncheon in the Armory. Adjournment of the general session, to be followed by the organization of the sections in their respective halls.

At 2 P.M., formal opening of Rockefeller Hall, the new Physics Laboratory of Cornell University, with short addresses by eminent men of science.

At 8 P.M., in Sibley Hall, President David Starr Jordan, of Stanford University, will give an illustrated lecture on the San Francisco disaster.

Saturday, June 30, 1906, at 9 A.M., meeting of the council in Boardman Hall.

At 10 A.M., meeting of the sections in their respective halls.

At 1 P.M., luncheon in the Armory.

At 2 P.M., meeting of the sections in their respective halls. Afternoon excursions.

At 8 P.M., a lecture, illustrated with lantern slides, on 'The South African Meeting of the British Association for the Advancement of Science,' will be delivered in Sibley Hall by

Professor Henry S. Carhart, of the University of Michigan.

Monday, July 2, 1906, at 9 A.M., meeting of the council in Boardman Hall.

At 10 A.M., meeting of the sections in their respective halls.

At 1 P.M., luncheon in the Armory.

At 2 P.M., meeting of the sections in their respective halls.

At 8 P.M., a lecture illustrated with lantern slides, on 'The Great Canals of the World,' will be delivered in Sibley Hall by Major General George W. Davis, U.S.A. Public address under the auspices of the local chapter of Sigma Xi commemorative of the founding of the society. After the meeting the visiting members of the society of the Sigma Xi will be the guests at a dinner given by the Cornell Chapter.

Tuesday, July 3, 1906, at 9 A.M., council meeting in Boardman Hall.

At 10 A.M., meeting of the sections in their respective halls.

At 2 P.M., closing session in Goldwin Smith Hall.

SECTIONAL MEETINGS.

Section A will hold no session at this meeting.

Section B will hold a meeting for the reading of papers in connection with the American Physical Society.

Section C will hold a meeting for the reading of papers in connection with the American Chemical Society.

Section D will hold a meeting for the reading of papers in connection with the Society for the Promotion of Engineering Education.

Section E will hold a meeting principally for field work.

Section F will hold a meeting for the reading of papers in connection with the American Microscopical Society.

Section G will hold a meeting principally for field work.

Section H will hold no session at this meeting.

Section I will hold a meeting for the reading of papers.

Section K will hold no session at this meeting.

HOTEL HEADQUARTERS AND ACCOMMODATIONS.

Ithaca Hotel (Headquarters) will accommodate 100; prices on American plan, $2 (two in room), $2.50 (one in room), $3 with bath.

Clinton House will accommodate 50; prices on American plan, $2 to $2.50.

Sage College on the campus—especially convenient for members accompanied by ladies or for ladies unaccompanied—will accommodate 100 for lodging and 250 for table board; price, $1.50 a day for lodging, breakfast and dinner, $1 a day for breakfast and dinner.

Fraternity Houses.—Through the courtesy of the chapters various fraternity houses on and near the campus will be thrown open for the accommodation of visiting members of the association and affiliated societies. Excellent quarters for about 200 visitors unaccompanied by ladies will thus be available. Assignments will be made in advance by the local secretary to those making application. Price will be the same as at Sage College, namely, $1.50 a day for lodging, breakfast and dinner.

Information concerning board and rooms in private houses may be had by application to the local secretary. Excellent rooms may be secured in the neighborhood of the campus and table board may be had at Sage College.

Luncheon.—Through the kindness of the university a simple lunch will be served daily in the Armory.

RAILROAD RATES.

A reduction of one fare and one third for the round trip, on the certificate plan, has been secured for those attending the Ithaca meeting from the Trunk Line, Eastern Canadian, New England, Central, and Southeastern Passenger Associations. No reduction has been granted by the Western and Southwestern Associations. The following directions are submitted for your guidance: (1) Tickets at full fare for the going journey may be secured within three days (exclusive of Sunday) prior to and during the first three days

of the meeting. You can obtain your ticket not earlier than June 25, nor later than June 30. Be sure when purchasing your going ticket you request a *certificate,* and do not make the mistake of asking for a *receipt.* On your arrival at the meeting present your certificate to R. S. Clifton, assistant secretary, general registration office, Goldwin Smith Hall, Cornell University. A special agent of the Trunk Line Association will be in attendance to validate certificates on June 30 and July 2. A fee of twenty-five cents will be collected for each certificate validated. If you arrive at the meeting and leave for home prior to the special agent's arrival, or if you arrive later than July 2, you can not have your certificate validated and will not get the benefit of the reduction. No refund of fare will be made on account of failure to have certificate validated. It must be understood that the reduction on the return journey is not guaranteed, but is contingent on an attendance of not less than one hundred persons holding certificates showing payment of full first-class fare of not less than 75 cents. If the necessary minimum is in attendance and your certificate is duly validated, you will be entitled up to July 6 to a continuous passage ticket to your destination by the route over which you make the going journey at one third the limited fare.

LOCAL COMMITTEE.

The officers are:

Honorary Presidents: Jacob Gould Schurman, Andrew Dickson White.

Chairman: Edward L. Nichols.

Secretary: Willard W. Rowlee.

Committee on Hotels and Accommodations: Abram W. Kerr.

Committee on Excursions: George F. Atkinson.

Committee on Transportation: Rolla C. Carpenter.

Committee on Finance: Henry S. Williams.

Committee on Places of Meeting: Frederick Bedell.

Committee on Entertainment of Visiting Ladies: Anna B. Comstock.

SCIENTIFIC NOTES AND NEWS.

Dr. L. A. Bauer has accepted the permanent directorship of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. Since the formation of this department on April 1, 1904, he has directed its work in addition to the duties devolving upon him as in charge of the magnetic survey and observatory work of the United States under the auspices of the Coast and Geodetic Survey. However, as soon as conditions will permit, after July 1, he will relinquish the charge of the latter work and devote his entire time to the magnetic work of the Carnegie Institution, which has been expanded so that a general magnetic survey of the globe is contemplated.

Professor W. H. Welch, of the Johns Hopkins University, and Professor Nicholas Senn, of the University of Chicago, have been elected honorary members of the Imperial Medical Society of Vienna. Professor J. J. Abel, of the Johns Hopkins University; Dr. John C. Hemmeter, of the University of Maryland; Professor C. A. Herter, of Columbia University; Dr. Graham Lusk, of the University and Bellevue Hospital Medical College; Professor L. Emmett Holt, of Columbia University, and Professor Jacques Loeb, of the University of California, were elected corresponding members.

McGill University will confer its doctorate of laws on Dr. Donald Macalister, Linacre lecturer of physics at Cambridge and president of the General Medical Council.

The honorary degree of doctor of civil law has been conferred at a special convocation of Durham University on Baron Takaki, the Japanese surgeon-general.

The French government has appointed a commission on agricultural hygiene, with Dr. Bruardel as president.

Professor A. E. Kennelly, of Harvard University, has been appointed by the American Institute of Electrical Engineers as a delegate to the International Commission for the standardization of nomenclature and ratings of electrical machinery to meet this summer in London.

SIR ALEXANDER B. W. KENNEDY has been elected president of the British Institution of Civil Engineers. The council of the institution has made the following awards for papers read and discussed during the past session: A Telford gold medal to Mr. J. A. Saner, a Watt gold medal to Mr. G. G. Stoney and a George Stephenson gold medal to Dr. I. E. Stanton; Telford premiums to Mr. Leonard Bairstow, Mr. H. S. Bidwell, Mr. J. J. Webster, Mr. Cathcart W. Methven, Mr. H. A. Mavor, Sir Frederick R. Oppcott; and a Manby premium to Mr. D. E. Lloyd-Davies.

DR. BRADLEY M. DAVIS has been spending the spring in Cambridge, completing a textbook of botany in co-authorship with Mr. Joseph Y. Bergen. His connection with the University of Chicago will end on July 1. He will be at Woods Hole through the summer.

DR. W. C. FARABEE, of the anthropological department at Harvard University, with three students, will next year conduct a research expedition about the headwaters of the Amazon. For a time a base will be established at Arequipa, Peru. The party will be gone three years.

DR. HENRY S. PRITCHETT, president of the Carnegie Foundation, will give the commencement address at the Rhode Island College on June 12, his subject being 'The Essentials of Good Administration.'

AT the recent meeting of Phi Beta Kappa at the University of Wisconsin, Dr. William Trelease, director of the Missouri Botanical Garden, made the address.

PROFESSOR W. J. SOLLAS began on May 24 a course of three lectures at the Royal Institution on 'Man and the Glacial Period.' The Friday evening discourse on May 25 was delivered by Mr. Leonard Hill, on 'Compressed Air and its Physiological Effects.'

PREPARATIONS have been made for celebrating on May 15 the fiftieth anniversary of the entrance on his life's work as teacher of zoology of Professor Eugene Renevier, of the University of Lausanne, whose death we were compelled to report last week.

THE trustees of the American Science and Historic Preservation Society have recently presented to congress a memorial in which they ask that a monument be erected at some place near the Grand Canyon of Colorado River to Major John Wesley Powell and his companions in the exploration of the canyon in 1869.

THE death is announced of Dr. Darwin D. Eads, who had practised medicine for forty years at Paris, Ky., and had made valuable botanical collections in the central states; and of Francis Louis Sperry, a mining engineer and mineralogist.

DR. WILHELM MEYERHOFER, docent in chemistry in the University of Berlin, died on April 21; Dr. K. Pape, formerly professor of physics at the University of Königsberg, has died at the age of seventy years; and Dr. Ernst Schellwien, adjunct professor of geology and paleontology at Königsberg, has died at the age of forty years.

It is a matter of considerable interest to scientific men that the Postal Union Congress which met recently at Rome has increased the weight of foreign letters requiring five cents postage from 15 to 20 grams. The reduction will be still greater for us, as the limit will be made one ounce. The cost for each further ounce will be reduced to three cents. The proposal has also been made to reduce the letter rate between Great Britain and the United States to two cents. This would not require further action by the union, and may be carried into effect by negotiations between the two countries.

MR. GEORGE EASTMAN, of Rochester, N. Y., has subscribed one thousand dollars annually for the next three years to enable the continuance of research work in photography at the Yerkes Observatory of the University of Chicago. The investigations will be carried on by Mr. R. James Wallace, photophysicist at the observatory.

THE College of Charleston Museum has acquired the valuable conchological collection of the late Dr. Edmund Ravenel, of Charleston,

which contains some 3,500 species of land, fresh water and marine shells.

The Danish Arctic Biologic Station will be open for investigators for the first time during the summer of 1907. Application for a table should be sent to the Danish ministry of education (Kultusministerium), through the consulate of the United States, Copenhagen, Denmark.

The astronomical observatory of La Plata has been affiliated with the new National University of La Plata, recently inaugurated by the minister of public instruction of the Argentine Republic.

It is announced that the issue of the *Index Medicus,* published by the Carnegie Institution, has been unavoidably delayed, owing to the recent printers' strikes. For this reason, the number for March has not as yet been published. On account of the strike the general index of the *Geologist* has also been delayed and will not appear until some time in June.

The German Zoological Society and the German Botanical Society are meeting this year at Marburg, beginning on June 5.

The Reale Instituto Veneto di Science, Lettere ed Arti has decided to commence a systematic scientific study of the geophysical phenomena which concern directly and indirectly the lagoon of Venice. With this object a special committee has been appointed, and the preliminary investigations, bearing principally on the tidal waves in the upper Adriatic and the rivers flowing into it and into the lagoon of Venice, have been intrusted to Dr. Giovanni Piero Magrini, who is to be assisted by Professors Luigi de Marchi and Tullio Gnesotto of the University of Padua.

The Paris correspondent of the London *Times* reports that at a meeting of the Academy of Medicine on May 16, Professor Metchnikoff supplemented his previous statement as to his prophylactic treatment of syphilis by important observations concerning some objections made against his method by Professor Neisser, of Breslau. Dr. Metchnikoff and Dr. Roux discovered by a number of experiments that infection by inoculation of the syphilitic virus in monkeys and men was arrested and nullified by application of the calomel ointment within an hour of the introduction of the virus. Professor Neisser, experimenting with Java monkeys, obtained by the same method results that were less satisfactory. He had only one hundred successful cases out of two hundred. Dr. Metchnikoff gave an explanation of this fact. Professor Neisser, he affirms, makes his scarifications too deep, by which method he completely alters the conditions of the experiment. In the majority of cases of normal syphilitic infection the virus penetrates by purely epidermic —that is to say very superficial—erosion. If it be artificially introduced into the lower tissues, the absorption takes place in less than an hour and the prophylactic treatment arrives necessarily too late. Dr. Roux and Dr. Metchnikoff, while practising scarifications certainly deeper than those which give rise to syphilitic infection in life, carefully avoided applying the virus too far below the surface.

We learn from *Nature* that the Republic of Uruguay has recently established a National Institute for Weather Prediction, with its central observatory at Monte Video; the meteorological observatory at that place was founded by the municipal authorities in 1895. Observations have been made at several stations for some years, and the new institution has commenced its operations by the collation and discussion of the means and extremes already available, and by the investigation of the characteristics of the severe storms which affect the navigation of the estuary of the Rio de La Plata. The most dangerous storms are those from the southeast, as they usually occur with a rising barometer, in connection with anticyclonic conditions over the Atlantic, and are frequently accompanied by thick fog on the coast. The first number of the bulletin of the institute contains an exposition of the hydrography of the estuary, and tables showing, *inter alia,* the effect of the various winds upon the tides of the river.

WE learn from the London *Times* that the senate of the University of London has invited representatives of the University of Paris and of the Collège de France to visit London. These representatives will be accompanied by the highest officials of the French Ministry of Public Instruction, and by a number of representatives of the French provincial universities. The Société des Professeurs de Langues Vivantes and of the Guilde Internationale will be simultaneously entertained by the Modern Language Association, and the university has arranged for the representation of all these bodies at the various ceremonies. The French delegations will be headed by M. Liard, the vice-rector of the University of Paris. The king has expressed his desire to receive a number of the French visitors at Windsor on Thursday afternoon, June 7. The general program includes the following: Monday, June 4, an informal dinner at the Royal Palace Hotel, Kensington, where the guests of the university will stay. Tuesday, June 5, a reception at the foreign office by Lord Fitzmaurice and Mr. Lough, M.P., parliamentary secretary of the board of eduation, at noon; luncheon at the university; addresses at the university by the vice-chancelor, M. Liard, Sir Arthur Rücker and Professor Sadler. Wednesday, June 6, visits to Westminster Abbey, to Westminster School and to some of the London County Council educational institutions, followed by a luncheon to be given by Mr. Evan Spicer, chairman of the County Council, at Belair, Dulwich; in the evening, a dinner at University College and various private dinners, followed by a reception by the French ambassador at the French embassy. Thursday, June 7, addresses by the deans of the Faculties of Arts and Science of the Universities of London and Paris, by Professor Sir William Ramsay and by representatives of the Collège de France, the French provincial universities and the French Modern Language Association; in the evening a *conversazione* at the university. A number of the French guests will, on Friday, June 8, visit the Universities of Oxford and Cambridge.

THE *Journal of the American Medical Association* reports that it is the purpose of Health Commissioner Dr. Dixon to destroy the breeding places of mosquitoes in Pennsylvania. The task will involve the examination of all places holding or capable of holding water in which the species can breed. Dr. Dixon has employed an expert entomologist to take up the work and map out all the malarial districts in the state. The report of the entomologist will give all conditions supplying the environment necessary to support the lives of the variety of mosquito which carry the poison from one person to another. That this work shall prove most economic, it is proposed that the country surrounding the larger centers of population be investigated and the most dangerous pools and streams be mapped out, starting with the built-up municipalities in the southern part of the state, where malaria is most prevalent. For the purpose of mapping the breeding places it is proposed that the United States Geological Survey maps be used.

THE following letter, dated May 1, has been sent by the post-office to the Decimal Association: "With reference to your further letters of April 11 and 27, concerning the treatment of letters for places abroad prepaid a single rate of postage and weighing more than half an ounce, but not more than 15 grams, I am directed by the postmaster-general to acquaint you that such letters for any foreign country included in the postal union are sent forward for delivery uncharged. The same treatment would be applied to any letter weighing more than 15 grams which might happen to be posted with 5d. prepaid on it, and so on for other weights. I am, Sir, your obedient servant, H. Buxton Forman." In forwarding a copy of this letter to the London *Times* the Decimal Association adds: "The metric weights and measures have, according to this communication, been adopted by the post-office for foreign letters, and it is difficult to understand how the representative of the British post-office at the Postal Congress in Rome, could have stated there that 'under

no condition would Great Britain adopt the metric system.'"

A MAP representing parts of California and Mexico has recently been published by the United States Geological Survey which is of unusual interest at this time. The area covered is widely known as the Salton Sink, a great depression in the Colorado Desert which has been much discussed lately, owing to the threatened formation of a large inland sea where there is now a thriving community. About 8,000 people have settled in that part of the basin known as the Imperial Valley and are raising excellent crops of barley and alfalfa. Stock farms are numerous and experiments in raising the date palm are in progress. The freight shipments from Imperial, a town only four years old, rival those of Los Angeles in value, and are said to exceed those of any other town in southern California. The existence of this peaceful community is however seriously endangered by Colorado River which strangely enough is also the source of all its prosperity as it is this stream which furnishes water for the irrigation system. The absence of any controlling works at the head of the main canal has resulted in diverting the river from its old channel and permitting the entire flood flow to enter the irrigation system. This is causing great damage to the ditches and crops, and is forming a large lake, which now covers about 250 square miles, at the lowest part of the sink. The Southern Pacific Railroad has been obliged to rebuild many miles of tracks. The map of this region, which is called the Salton Sink special, shows on a scale of about eight miles to an inch, all the principal towns, roads, canals and drainage lines. Contour lines also indicate what the future sea may cover at different altitudes. The usual price of five cents a copy will be charged for this map, which was made by Mr. W. Carvel Hall, under the direction of Mr. R. B. Marshall.

A REPORT from Consul-General George W. Roosevelt describes a series of experiments arranged by the meteorologic service of Belgium to be made with balloons for the purpose of determining the pressure of the atmosphere and the temperature and moisture of the air. In the subjoined report Consul-General Roosevelt furnishes the result of the first experiment. The trial was made at 7:21 A.M., April 5, with two balloons coupled together measuring respectively 1.90 meters and 1.35 meters in diameter. The balloons rapidly ascended, quickly attained a very high altitude, and disappeared in a south-southeast direction. About 10 A.M. they descended at Wancennes, a village some 113 kilometers from Brussels. The altitude was about 15,000 meters, where the atmospheric pressure as registered by an aneroid barometer was only 86 millimeters. During the trial the velocity of the wind on land registered 2 meters per second and 10 meters in the upper air. The culminating point of ascension was reached between 8:20 and 8:26 A.M., but the lowest temperature (— 57.4°) was registered a little later, at 8:37 A.M., by 110 millimeters, barometric pressure. The balloons passed through the same zone of intense cold at 8:09 A.M. Temperature, — 56°; pressure, 104 millimeters. When the balloons were sent up the relative degree of atmospheric humidity was 80 per cent., but rapidly diminished, and at 9:13 A.M. descended to 32 per cent. Small balloons sent up simultaneously with the two sounding balloons took a direct easterly direction, one going as far as Duren, Germany, a small town situated between Aix-la-Chapelle and Cologne, about 193 kilometers from Brussels.

THE London *Times* says: "Through the courtesy of the president of the Iron and Steel Institute (Mr. R. A. Hadfield) we are enabled to refer to some of the arrangements which have been made for the reception of the American Society of Engineers on their visit to this country in July. The executive committee of the Iron and Steel Institute, among whom are to be numbered the president, Sir James Kitson, Mr. Andrew Carnegie and Sir Hugh Bell, may be trusted to show a due appreciation of the very high altitudes attained by American hospitality and a determination that nothing shall be wanting in a proper emulation of the exertions which

have been displayed by our neighbors in the entertainment of guests from this country. The members of the Iron and Steel Institute have on two occasions been entertained by their *confrères* on the other side of the Atlantic. The 200 members or so who went to the United States, the expedition being headed in the first instance by Sir James Kitson and in the second by Mr. Carnegie, found the pleasures spread for their delectation so profuse, and every one possessed with so consuming a desire to afford them entertainment, that they had little leisure for the calm and collected examination of those productive resources in the American iron and steel industry the inspection of which were the ostensible purpose of the journey. The American Society of Engineers are assured of the heartiest welcome in this country. We can not hope to emulate their hospitality on the scale upon which it was extended to the members of the Iron and Steel Institute; for a tour of 12,000 miles within the area of our shores is impossible unless it were conducted in a circular direction. But in spirit we can fairly vie with our American colleagues, and the heartiness of our welcome to them will not be inferior to that given by them to our own countrymen."

UNIVERSITY AND EDUCATIONAL NEWS.

IT is announced that Mr. David Rankin, of St. Louis, has decided to give $2,000,000 to found an industrial and manual training school in St. Louis.

THE college of agriculture of the University of Wisconsin, the attendance of which has increased very greatly during the past two years, is to receive two important additions in the form of an agronomy building and agricultural engineering building. The plans for both structures have just been completed, and the contracts, which are about to be made, provide for their completion before the beginning of the short course in agriculture next winter.

AT the commencement exercises of the University of Nevada, May 31, 1906, President Stubbs announced that Mr. Clarence H. Mackay and his mother, Mrs. John W. Mackay, have together given $50,000 for the immediate erection of a building for the College of Mines. This building is to house the department of mining and metallurgy and that of geology and mineralogy and has been planned according to the recommendations of the heads of these departments. A recent state appropriation for the metallurgical laboratory has provided the university with a new ore-treating equipment which will be suitable for installing in the new quarters. The building will also contain a geological museum. Furthermore, Mr. F. M. Smith has arranged to provide an income of $1,000 a year to be used for the support and encouragement of students in the Mining School. This will in general be divided into five annual scholarships of $200 each to be known as the F. M. Smith scholarships open to deserving students irrespective of citizenship or residence.

THE preliminaries for the establishment of a Hindu University are making progress. Offers of service are coming in from the principals and professors of the leading colleges of India, and the Munshi Madho Lal, who gave $100,000 to the endowment, has been conferring on the details of the foundation. A deputation will be sent to collect subscriptions throughout India.

Nature states that steps are being taken for the provision of a permanent endowment to place the Balfour library in a secure position. The library owes its origin to the generosity of the family of the late Professor F. M. Balfour, who after his death in 1882 presented his scientific books to Cambridge University for the use of the zoological laboratory. The library so constituted was housed in a room adjacent to the laboratory, and has ever since been freely open to all members of the university and to others qualified to make use of it. The library has been maintained hitherto out of the fees paid by students attending the classes; and the burden which it thus places upon the resources of the laboratory is undesirable. A committee has, therefore, been formed for the purpose of collecting subscrip-

tions, and of establishing a fund to be called the Balfour Library Endowment Fund, with the object of putting the library on a secure and satisfactory basis. The committee at its first meeting agreed that the fund, when established, 'be offered to the university at such time and under such conditions as the subscribers shall hereafter determine, provided that the management be closely connected with the zoological laboratory, and that the library be freely open to students.' Subscriptions may be paid to the Balfour Library Endowment Fund, at Messrs. Barclay's Bank, or to the treasurer, Mr. Adam Sedgwick, Zoological Laboratory, New Museums, Cambridge. The sum already received or promised amounts to about £500.

Sir Donald Currie, through whose gift of upwards of $500,000 the buildings are being erected, will lay the foundation-stone of the School of Advanced Medical Studies, Nurses' Home and Maternity Students' House, in connection with University College Hospital on June 11.

The fifty-third commencement of the University of Wisconsin will be held from Sunday, June 17, to Wednesday, June 20. About 450 students will be granted the bachelor's degree on this occasion, 38 the master's degree and 12 the doctor's degree, making a total of over 500 degrees to be conferred, the largest number that has ever been awarded at any commencement.

The corporation of the Massachusetts Institute of Technology has postponed the election of a president to succeed Dr. Henry S. Pritchett, who will retain the presidency until the autumn.

Dr. H. S. Jennings, now of the University of Pennsylvania, has been appointed associate professor of physiological zoology at Johns Hopkins University.

By recent action of the executive committee of the board of trustees of Cornell University, the title of Professor R. S. Tarr's chair has been changed from dynamic geology and physical geography to physical geography, and he has been given charge of the newly created department of physical geography, which has been separated from the department of geology.

Colorado College has established a school of forestry, with Dr. W. C. Sturgis as dean.

The faculty appointments at the Massachusetts Institute of Technology for 1906–7 are as follows: Associate Professors William O. Crosby, Frederick S. Woods and Harry M. Goodwin appointed professors of geology, mathematics, physics and electrochemistry, respectively. The following assistant professors have been promoted to associate professorships: Augustus H. Gill in technical analysis, Arthur G. Robbins in highway engineering, Frank A. Laws in electrical testing, Charles E. Fuller, William A. Johnston and Charles F. Park in mechanical engineering, Frank P. McKibben in civil engineering. Nathan R. George, Jr., Archer T. Robinson and Charles E. Locke have been promoted from instructorships to assistant professorships in mathematics, English and mining engineering and metallurgy, respectively.

At Dartmouth College, Dr. John H. Gerould has been promoted to an assistant professorship of biology and Dr. John M. Poor to an assistant professorship of astronomy. Mr. Ralph M. Barton has been appointed instructor in mathematics.

At Clark College, Dr. Fred Mutchler has been promoted to an assistant professorship of botany and Dr. Millet T. Thompson to an assistant professorship of zoology.

Assistant Professor W. J. Morse, of the botanical department of the University of Vermont, will go on July 1 to the University of Maine, as botanist of the experiment station. Professor Morse's work at Vermont will be divided between two younger men, Mr. H. A. Edson being appointed instructor in botany and Mr. N. J. Giddings botanical assistant in the experiment station.

A. S. Eve has been appointed assistant professor in mathematics in McGill University; Dr. S. B. Leacock, assistant professor of political science and history; and Dr. H. T. Barnes, associate professor of physics.